

Los Alamos National Laboratory  
Environmental Restoration Program  
Standard Operating Procedure

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Canister Sampling for Organics - EPA Method T0-14

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## **CANISTER SAMPLING FOR ORGANICS-EPA METHOD T0-14**

### **1.0 PURPOSE**

This procedure describes the sampling for volatile organic compounds (VOCs) in ambient air using SUMMA® passivated canisters for the Environmental Restoration (ER) program.

### **2.0 SCOPE**

#### **2.1 Applicability**

This method is applicable for sampling specific VOCs that have been tested and are stable when stored in pressurized or subatmospheric pressure canisters.

#### **2.2 Training**

The field team members should be familiar with the objectives of canister sampling for VOCs and must document that they have read and understand this and the procedures in Section 1.0, General Instructions.

### **3.0 DEFINITIONS**

- A. Absolute canister pressure:  $P_g + P_a$ , where  $P_g$  = gauge pressure in the canister (kPa, psi) and  $P_a$  = barometric pressure (kPa, psi).
- B. Absolute pressure: Pressure measured with reference to absolute zero pressure (as opposed to atmospheric pressure), usually expressed as kPa, mm Hg or psia.
- C. Cryogen: A refrigerant used to obtain very low temperatures in the cryogenic trap of the analytical system. A typical cryogen is liquid oxygen (bp  $-183.0^{\circ}\text{C}$ ) or liquid argon (bp  $-185.7^{\circ}\text{C}$ ).
- D. Dynamic calibration: Calibration of an analytical system using calibration gas standard concentrations in a form identical or very similar to the samples to be analyzed and by introducing such standards into the inlet of the sampling or analytical system in a manner very similar to the normal sampling or analytical process.
- E. Gauge pressure: Pressure measured greater than ambient atmospheric pressure (as opposed to absolute pressure). Zero gauge pressure is equal to ambient atmospheric (barometric) pressure. Gauge pressure is usually expressed as kPa, mm Hg, or psig.
- F. MS-SCAN: The gas chromatograph (GC) is coupled to a mass spectrometer (MS) programmed in the SCAN mode to repeatedly scan all ions during the GC run. As used in

the current context, this procedure serves as a qualitative identification and characterization of the sample.

- G. MS-SIM: The GC is coupled to a MS programmed to acquire data for only specified ions and to disregard all others. This is performed using selecting ion monitoring (SIM) mode coupled to retention time discriminators. The GC-SIM analysis provides quantitative results for selected constituents of the sample gas as programmed by the user.
- H. Pressurized sampling: Collection of an air sample in a canister using a sample pump with a (final) canister pressure greater than atmospheric pressure.
- I. Qualitative accuracy: The ability of an analytical system to correctly identify compounds.
- J. Quantitative accuracy: The ability of an analytical system to correctly measure the concentration of an identified compound.

#### 4.0 BACKGROUND AND/OR CAUTIONS

##### 4.1 Background Information

Both subatmospheric pressure and pressurized sampling modes use an initially evacuated canister and a pump-ventilated sample line during sample collection. Pressurized sampling requires an additional pump to provide positive pressure to the sample canister. A sample of ambient air is drawn through a sampling train. The sampling train comprises components that regulate the rate and duration of sampling into a pre-evacuated SUMMA® passivated canister. After the air sample is collected, the canister valve is closed, an identification tag is attached to the canister, and the canister is transported to a laboratory for analysis.

This method is generally used for the collection of non-polar, insoluble (or slightly soluble) compounds. The method is severely limited in determining highly soluble compounds (i.e. alcohols, ketones, acetonitriles) due to the sample analysis procedure. For these highly water soluble compounds, Tenax™ resin media tubes and a "Volatile Organic Sampling Train," details this procedure.

Collection of ambient air samples in canisters provides (1) convenient integration of ambient samples over a specific time period, (e.g., 24 hours); (2) remote sampling and central analysis; (3) ease of storing and shipping samples; (4) unattended sample collection; (5) analysis of samples from multiple sites with one analytical system; and (6) collection of sufficient sample volume to allow assessment of measurement precision and/or analysis of samples by several analytical systems. Care, however, must be exercised in selecting, cleaning, and handling sample canisters and sampling apparatus to avoid losses or contamination of the samples. Contamination is a critical issue with canister-based sampling because the canister is the last element in the sampling train. Interior surfaces of the canisters are treated by the SUMMA® passivation process, in which a pure chrome-

nickel oxide is formed on the surface. This type of vessel has been used in the past for sample collection and has demonstrated sample storage stability of many specific organic compounds. All other sampling equipment (e.g., pump and flow controllers) should be thoroughly cleaned to ensure that the filling apparatus will not contaminate samples.

In preparation for subatmospheric sample collection in a canister, the canister is evacuated to 0.05 mm Hg. When opened to the atmosphere containing the VOCs to be sampled, the differential pressure causes the sample to flow into the canister. This technique may be used to collect grab samples (duration of 10 to 30 seconds) or time-integrated samples (duration of 12 to 24 hours) taken through a flow-restrictive inlet (e.g., mass flow controller, critical orifice). With a critical orifice flow restrictor, there will be a decrease in the flow rate as the pressure approaches atmospheric. With a mass flow controller, however, the subatmospheric sampling system can maintain a constant flow rate from full vacuum to within about 7 kPa (1.0 psi) or less below ambient pressure.

Pressurized sampling is used when longer-term integrated samples or higher volume samples are required. A metal bellows-type pump draws in ambient air from the sampling manifold to fill and pressurize the sample canister. The sample is collected in a canister using a pump and flow control arrangement to achieve a typical 103-206 kPa (15 to 30 psig) final canister pressure. For example, a 6-liter evacuated canister can be filled at 10 cm<sup>3</sup>/min for 24 hours to achieve a final pressure of about 144 kPa (21 psig).

#### 4.2 Precautions and Safety Issues

While working at the site, and especially during sampling operations, personnel safety procedures will be observed to prevent exposure to chemical and physical hazards. These procedures will encompass standard safety practices as well as those established by the site safety officer and those found in the Site Health and Safety Plan.

This SOP requires the use of the following equipment: compressed gas cylinders and canisters, cryogenic fluids (with temperatures typically less than -180° C), chemical reagents and gases, and a field GC or GC/MS unit. All of the previously mentioned equipment must be handled and used in a manner that ensures safety. Carefully read all manufacturer's warning labels associated with equipment. Contact the site safety officer to review Material Safety Data Sheets (MSDSs) for any reagents and gases before implementing this procedure, and review the Site Health and Safety Plan. If any reagents are purchased for the execution of this SOP, make sure that the site safety officer receives copies of the MSDS. At a minimum, safety glasses, safety shoes and hard hats will be required in designated areas of hazardous activities. Insulated gloves and containment equipment will be used when handling cryogenic fluids. Other personal protective equipment may be required as specified by the site safety officer.

## 5.0 EQUIPMENT

Equipment required to implement this procedure is specified in detail in the EPA Compendium Method TO-14, May 1988. Attachments A, B, C, D, and E diagram the sampling and analytical systems required.

## 6.0 PROCEDURE

A detailed description of the canister sampling method is provided in "The Determination of Volatile Organic Compounds (VOCs) in Ambient Air Using SUMMA® Passivated Canister Sampling and Gas Chromatograph Analysis" by the Environmental Protection Agency Compendium Method TO-14, May 1988.

The following is a summary of that compendium:

- A. The sample canister should be cleaned and tested according to the procedure in Attachment F.
- B. A sample collection system is assembled as shown in Attachment B and C and must meet certification requirements as outlined in Attachment G. (Note: The sampling system should be contained in an appropriate enclosure.)
- C. Prior to locating the sampling system, the user may want to perform "screening analyses" using a portable GC system, to determine potential volatile organics present and potential "hot spots." The information gathered from the portable GC screening analysis is used in developing a monitoring protocol, which includes the sampling system location, based upon the "screening analysis" results.
- D. After "screening analysis," the sampling system is located. Temperatures of ambient air and sampler box interior are recorded on a Canister Sampling Field Data Sheet, see Attachment H. For general instructions on filling out forms, refer to SOP-01.01.01, Records.
- E. To verify correct sample flow, a "practice" (evacuated) canister is used in the sampling system. (Note: For a subatmospheric sampler, the flowmeter and practice canister are needed. For the pump-driven system, the practice canister is not needed, as the flow can be measured at the outlet of the system). A certified mass flowmeter is attached to the inlet line of the manifold, immediately in front of the filter. The canister is opened. The sampler is turned on and the reading of the certified mass flowmeter is compared to the sampler mass flow controller. The values should agree within  $\pm 10\%$ . If not, the sampler mass flowmeter needs to be recalibrated or there is a leak in the system. This should be investigated and corrected. (Note: Mass flowmeter readings may drift. Check the zero reading carefully. To compensate for any zero drift, add or subtract the zero reading when reading or adjusting the sampler flow rate). After 2 minutes, the desired canister flow rate is adjusted to the proper value (as indicated by the certified mass flowmeter) by the sampler

flow control unit controller (e.g., 3.5 cm<sup>3</sup>/min for 24 hr, 7.0 cm<sup>3</sup>/min for 12 hr). Record final flow on Canister Sampling Field Data Sheet, Attachment H.

- F. The sampler is turned off and the elapsed time meter is reset to 000.0. (Note: Any time the sampler is turned off, wait at least 30 seconds to turn the sampler back on.) The "practice" canister and certified mass flowmeter are disconnected and a clean certified (refer to Attachment F) canister is attached to the system.
- G. The canister valve and vacuum/pressure gauge valve are opened. Pressure/vacuum in the canister is recorded on the canister sampling field data sheet (Attachment H) as indicated by the sampler vacuum/pressure gauge.
- H. The vacuum/pressure gauge valve is closed and the maximum/minimum thermometer is reset to current temperature. Time of day and elapsed time meter readings are recorded on the canister sampling field data sheet (Attachment H).
- I. Sampling commences and stops by the programmed electronic timer.
- J. After the desired sampling period, the maximum/minimum, current interior temperature and current ambient temperature are recorded on the sampling field data sheet. The current reading from the flow controller is recorded. At the end of the sampling period, the vacuum/pressure gauge valve on the sampler is briefly opened and closed and the pressure/vacuum is recorded on the canister sampling field data sheet. Pressure should be close to desired pressure. (Note: For a subatmospheric sampling system, if the canister is at atmospheric pressure when the field final pressure check is performed, the sampling period may be suspect. This information should be noted on the canister sampling field data sheet). Time of day and elapsed time meter readings are also recorded.
- K. The canister valve is closed. The sampling line is disconnected from the canister and the canister is removed from the system. For a subatmospheric system, a certified mass flowmeter is again connected to the inlet manifold in front of the in-line filter and a "practice" canister is attached to the Magnelatch valve of the sampling system. The final flow rate is recorded on the canister sampling field data sheet. (Note: For a pressurized system, the final flow may be measured directly.) The sampler is turned off. An identification tag is attached to the canister. Canister serial number, sample number, location, and date are recorded on the tag.
- L. When the sample canister is used to sample high concentration ( $\geq 1,000$  ppm) gas streams, special precautions are required for sample handling at the analytical laboratory and in the field. First, a warning statement to the laboratory is included on the Chain-of-Custody/Request for Analysis forms and sample data sheets sent along with the sample canister. Secondly, a special warning label must be attached to the canister, in addition to the sample ID tag, prior to shipment. These two steps are performed so that the analyst can adjust the GC unit's sensitivity before analysis to avoid instrument contamination. Also, the laboratory personnel responsible for the cleaning of the canisters will know to use a

methanol rinse cleaning procedure to remove any residual, high-contaminant gas condensate in the canisters.

In addition to these laboratory preparation steps, high-concentration canister sampling requires a more thorough decontamination of all used sampling equipment. The usual decontamination procedures (Attachment G) should be repeated for all affected sampling equipment. Decontamination procedures should always be followed by a field sampling system blank check (Section 6.1).

- M. Decontaminate specified sampling equipment using the protocol found in Attachment F. For other equipment used, follow SOP-02.07, General Equipment Decontamination.

#### 6.1 Quality Assurance/Quality Control Procedures, Frequencies, and Acceptance Criteria

To ensure that the samples collected are representative of the true sample matrix the following field QA/QC procedures will be performed:

QA/QC PROCEDURE	METHOD TO-14 SECTION	FREQUENCY	ACCEPTANCE CRITERIA
Flowmeter Verification	9.2.5	Before and after each sample collection	$\pm 10\%$ of certified
Canister Cleaning and Certification	11.1	Before canister is prepared for collecting a sample	Less than $<0.2$ ppbv of target VOCs found; verify first 10 canisters, if all are $<0.2$ ppbv, then verify 1/10
Canister Leak/ Pressure Check	11.1.2	After each canister cleaning	Pressurize to 30 psig for 24 hours, $<2$ psig maximum change
Field Sampling System Cleaning and Certification	11.2	Before the sampling system is used for collecting a sample	Less than $<0.2$ ppbv of target VOCs found
Field Sampling System Certification using Calibration Gas Standards	11.2.3	Before the sampling system is used for collecting a sample	90-110% Recovery
Sampling System Audit	12.2	Once for each field sampling system used; sample each cylinder in triplicate	90-110% Recovery $\pm 25\%$ RSD

Use the referenced sections of Method TO-14 to find the specific methodology. In addition, Attachment F of this SOP summarizes the canister cleaning procedure and Attachment G addresses the field sampling system cleaning and certification procedures.



The analytical QA/QC procedures will be in accordance with Method TO-14. These procedures depend on the type of analytical system employed (i.e., GC/MS or GC/Multidetector). Method TO-14 Section 12.5.2 specifies the QA/QC procedures and acceptance criteria for the GC/MS system. Section 12.5.3 specifies the GC/Multi-detector system QA/QC procedures and acceptance criteria. In addition to Method TO-14 procedures, the following analytical protocols will be employed:

1. Accuracy determinations

Surrogate spikes: Known concentrations of surrogate compounds (in a gas) will be added to the sample gas stream as the stream is purged from the canister, but before the stream enters the analytical system. The recovery of these compounds is used as a determination of analytical accuracy.

Blank canister spikes: A blank sample canister will be directly spiked with a known concentration of the analytes of interest in nitrogen gas. The spike will be allowed to equilibrate in the canister and then analyzed using the same methodologies used in analyzing actual canister samples. The recovery of the spiked compounds indicates the accuracy of the canister sample method and of the analytical system.

2. Precision determination

Replicate analysis: Multiple aliquots of sample gas will be purged from the sample canister and analyzed individually. Analytical precision is determined by relative percent difference.

6.2 Documentation

- A. Complete all data collection forms and calibration forms. Use the Daily Activity Log in SOP-01.01.01 to record general comments and other information not included elsewhere.
- B. Complete sample control forms (SOP-01.04).
- C. Fill out all required shipping forms for the samples per in SOP-01.03, Handling, Packaging, and Shipping of Samples, and ship the samples to the preapproved analytical laboratory.

### 6.3 Postoperation Activities

- A. Contact the analytical lab to ensure that samples arrived safely and instructions for sample analysis are clearly understood.
- B. Disassemble and clean all equipment and prepare them for storage.

## 7.0 REFERENCES

The following procedures are directly associated with this procedure and should be reviewed before canister sampling:

LANL-ER-SOPs in Section 1.0, General Instructions.  
LANL-ER-SOP-02.07, General Equipment Decontamination.  
LANL-ER-SOP-06.21, Volatile Organic Sampling Train.

EPA. May 1988. Compendium Method T0-14 "The Determination of Volatile Organic Compounds (VOCs) in Ambient Air Using SUMMA® Passivated Canister Sampling and Gas Chromatographic Analysis."

## 8.0 RECORDS

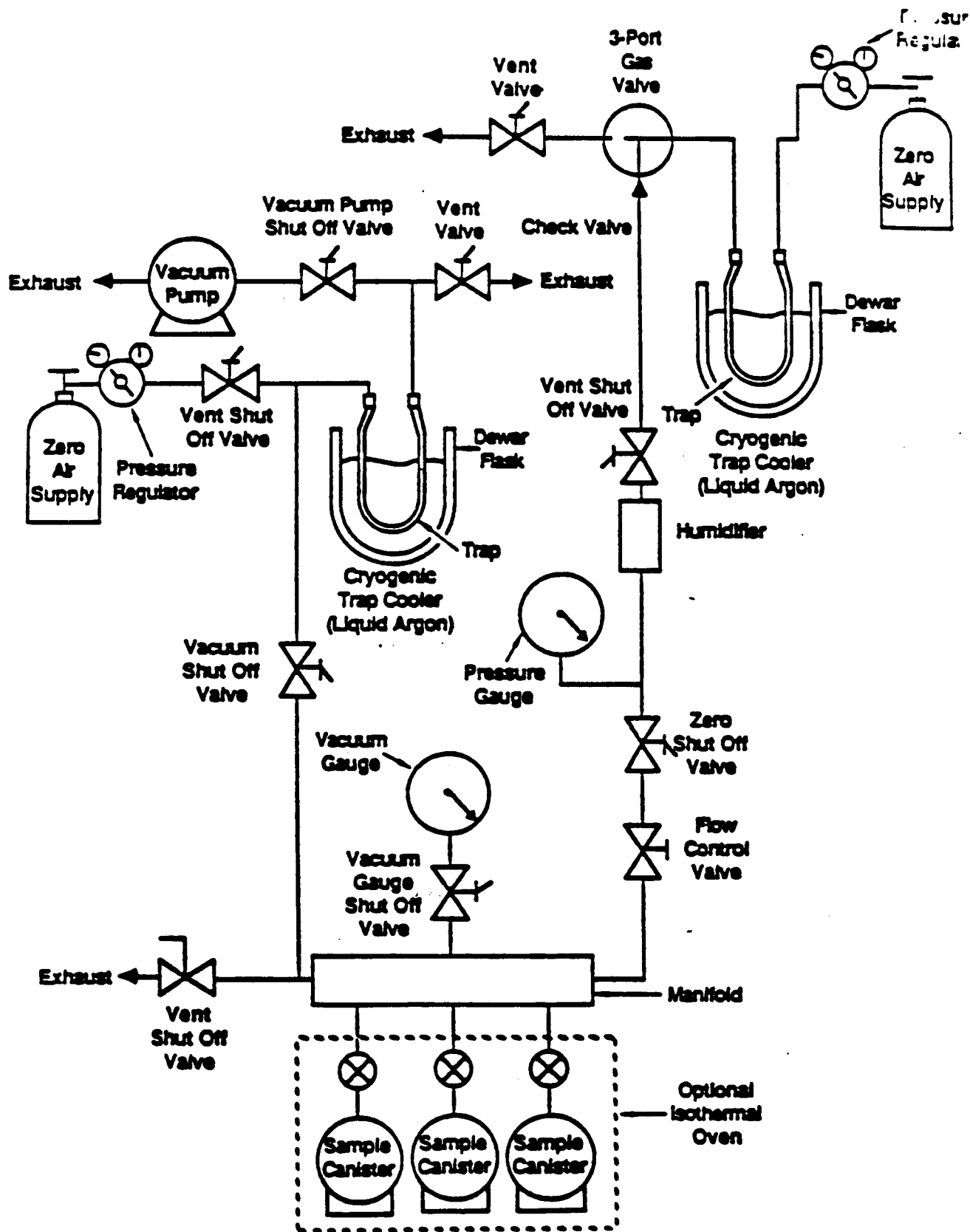
- A. Completed Canister Sampling Field Data Sheet
- B. Completed Chain-of-Custody/Request for Analysis Form
- C. Completed Calibration records
- D. Completed Daily Activity Log including any deviations and other pertinent information

## 9.0 ATTACHMENTS

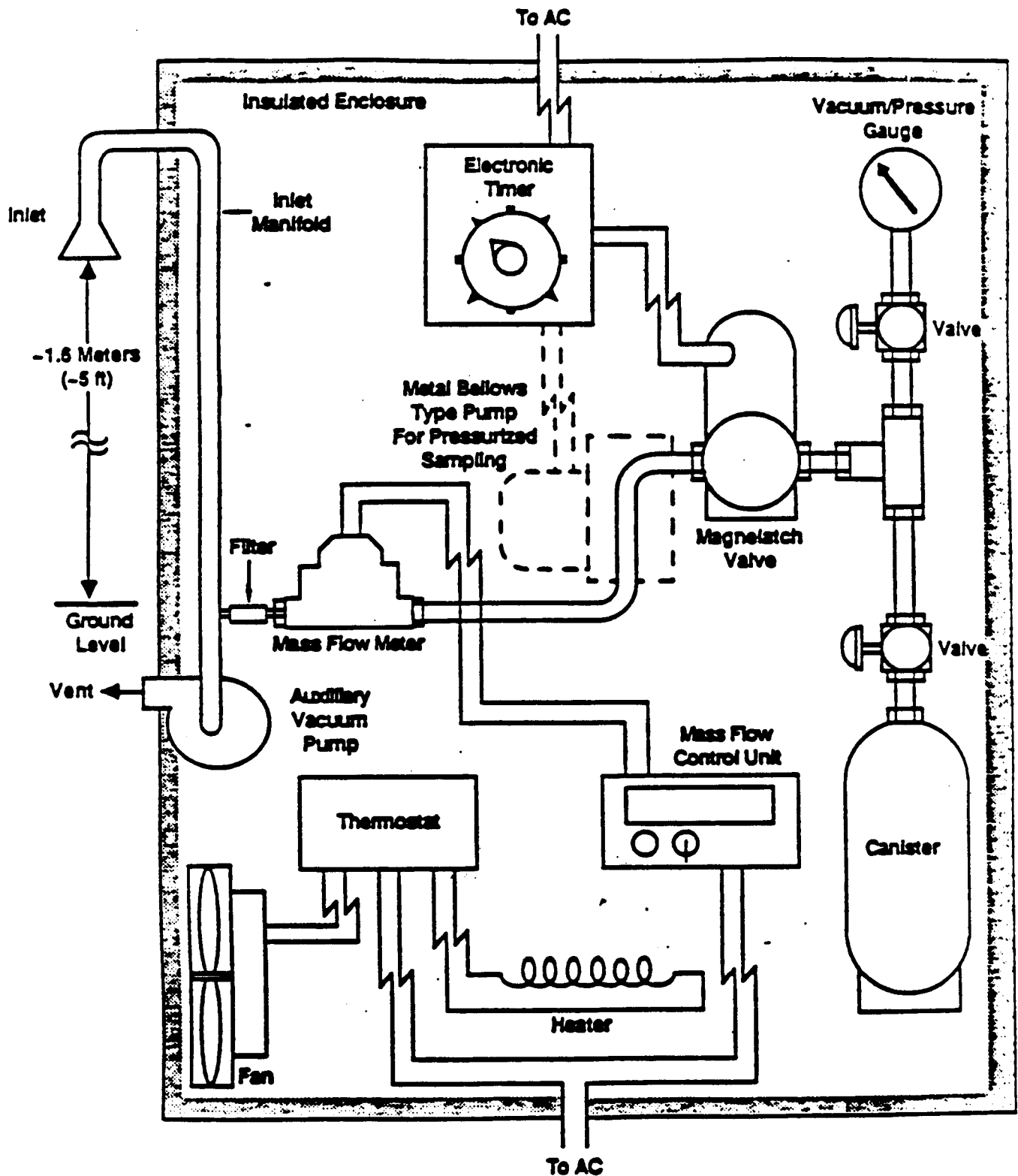
- A. Canister Cleaning System
- B. Sampler Configuration for Subatmospheric Pressure or Pressurized Canister Sampling
- C. Alternative Sampler Configuration for Pressurized Canister Sampling
- D. Schematic of Calibration System and Manifold for: (a) Analytical System Calibration, (b) Testing Canister Sampling System, and (c) Preparing Canister Transfer Standards
- E. Canister Analysis Utilizing GC-MS-SCAN-SIM Analytical System with Optional Flame Ionization Detector with the 6-Port Chromatographic Valve in the Sample Desorption Mode
- F. Canister Cleaning and Certification Procedures

- G. Sampling System Cleaning and Certification Procedures
- H. Canister Sampling Field Data Sheet
- I. Data Form Completion
- J. Example of Humid Zero Air Test Results for (a) a Clean Sampler and (b) a Contaminated Sampler

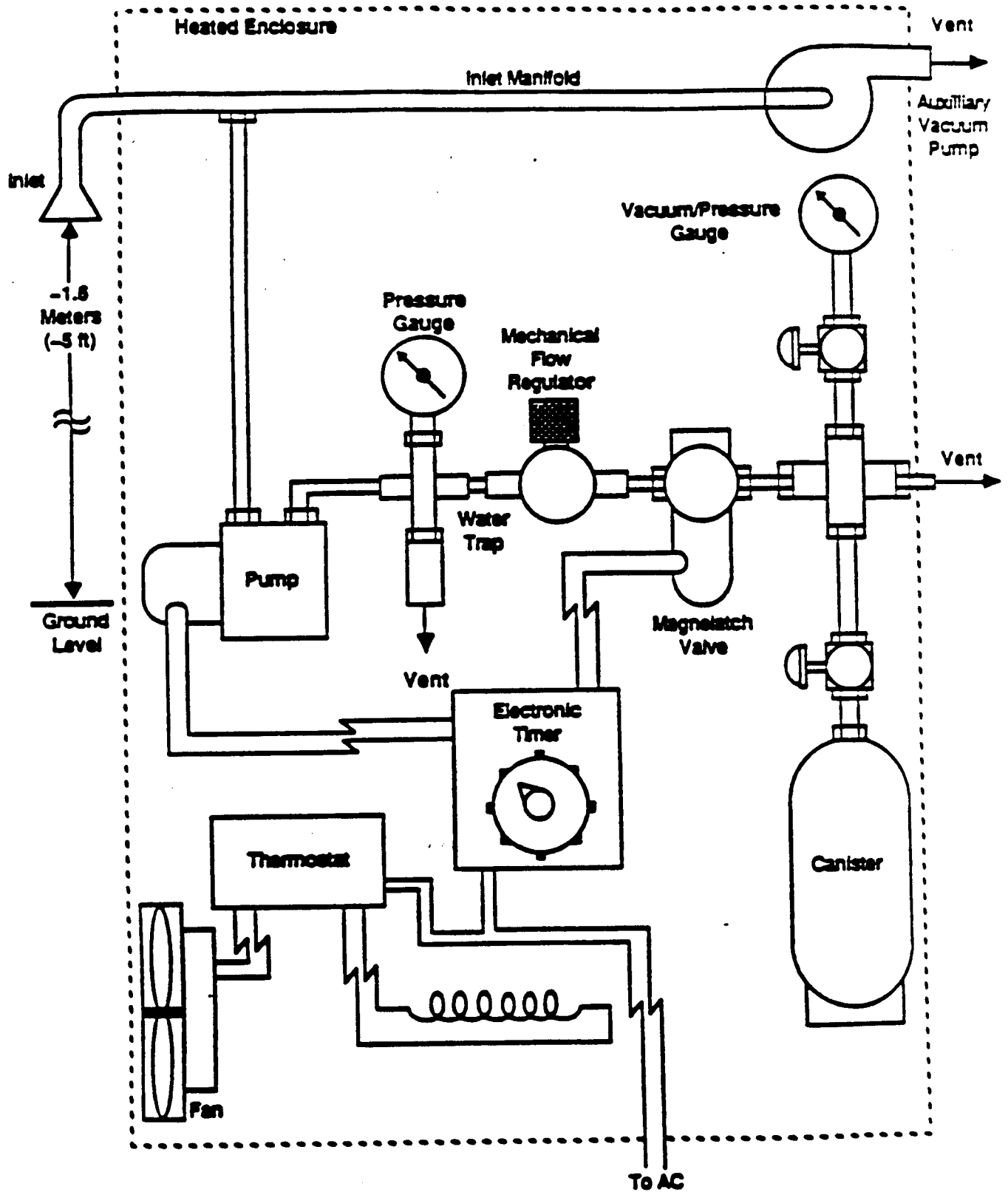
# CANISTER CLEANING SYSTEM



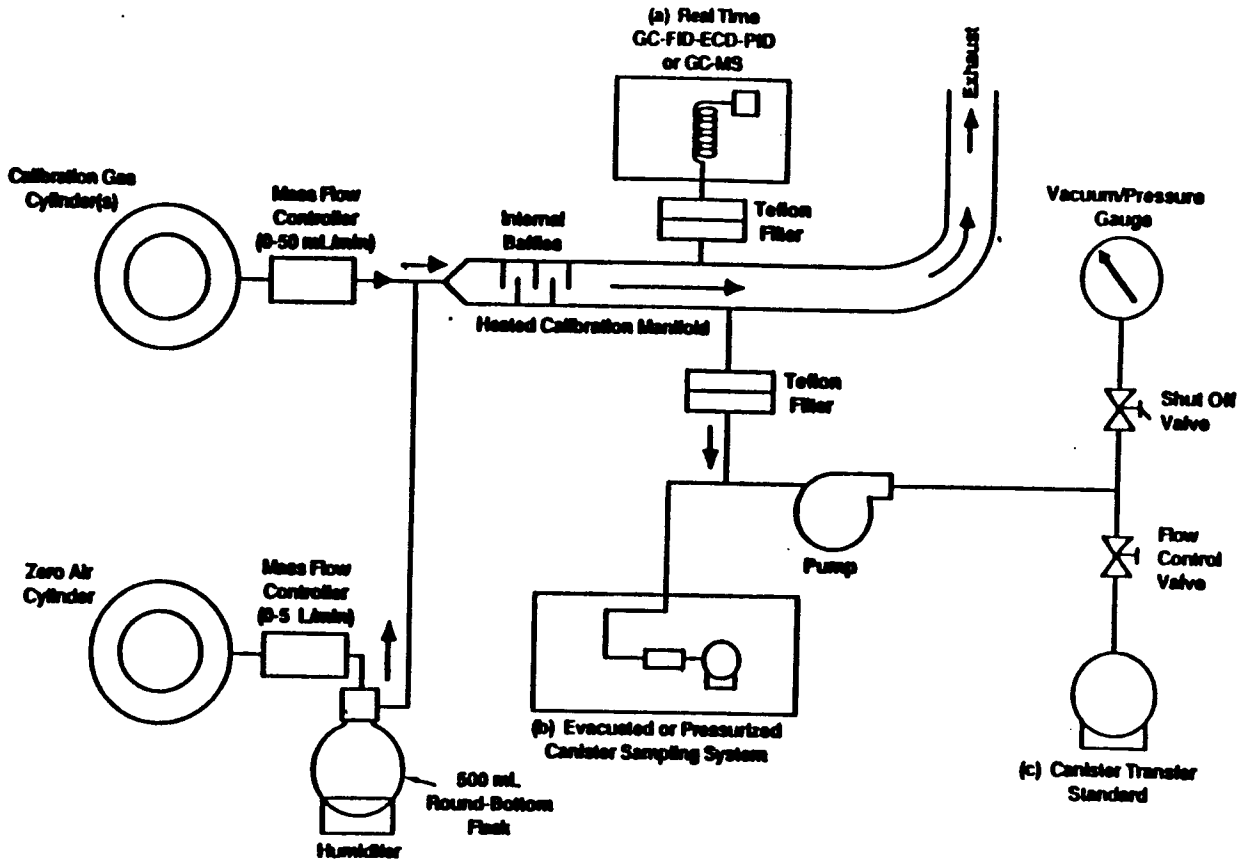
# SAMPLER CONFIGURATION FOR SUBATMOSPHERIC PRESSURE OR PRESSURIZED CANISTER SAMPLING



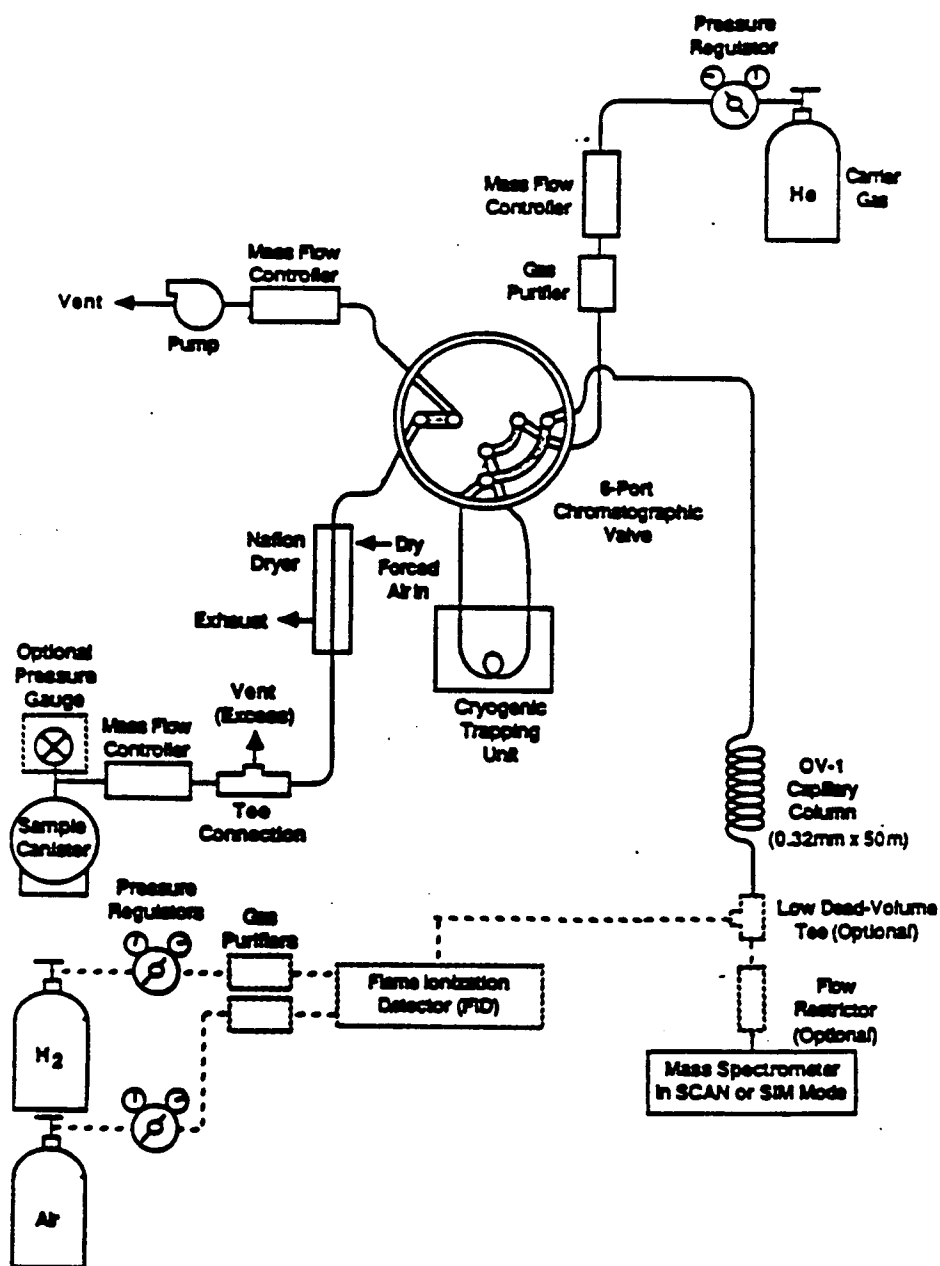
# ALTERNATIVE SAMPLER CONFIGURATION FOR PRESSURIZED CANISTER SAMPLING



**SCHEMATIC OF CALIBRATION SYSTEM AND MANIFOLD FOR:  
 (a) ANALYTICAL SYSTEM CALIBRATION, (b) TESTING  
 CANISTER SAMPLING SYSTEM AND, (c) PREPARING  
 CANISTER TRANSFER STANDARDS**



**CANISTER ANALYSIS UTILIZING GC-MS-SCAN-SIM ANALYTICAL SYSTEM  
WITH OPTIONAL FLAME IONIZATION DETECTOR WITH THE 6-PORT  
CHROMATOGRAPHIC VALVE IN THE SAMPLE DESORPTION MODE**





## CANISTER CLEANING AND CERTIFICATION PROCEDURES

- A. All canisters must be clean and free of any contaminants before sample collection.
- B. All canisters are leak tested by pressurizing them to approximately 206 kPa (30 psig) with zero air. (Note: The canister cleaning system in Attachment A can be used for this task.) The initial pressure is measured, the canister valve is closed, and the final pressure is checked after 24 hours. If leak tight, the pressure should not vary more than  $\pm 13.8$  kPa ( $\pm 2$  psig) over the 24 hour period.
- C. A canister cleaning system may be assembled as illustrated in Attachment A. Cryogen is added to both the vacuum pump and zero air supply traps. The canister(s) are connected to the manifold. The vent shut-off valve and the canister valve(s) are opened to release any remaining pressure in the canister(s). The vacuum pump is started and the vent shut-off valve is then closed and the vacuum shut-off valve is opened. The canister(s) are evacuated to  $< 0.05$  mm Hg (for at least one hour). (Note: On a daily basis or more often if necessary, the cryogenic traps should be purged with zero air to remove any trapped water from previous canister cleaning cycles.)
- D. The vacuum and vacuum/pressure gauge shut-off valves are closed and the zero air shut-off valve is opened to pressurize the canister(s) with humid zero air to approximately 206 kPa (30 psig). If a zero gas generator system is used, the flow rate may need to be limited to maintain the zero air quality.
- E. The zero shut-off valve is closed and the canister(s) are allowed to vent down to atmospheric pressure through the vent shut-off valve. The vent shut-off valve is closed. Steps C through E are repeated two additional times for a total of three (3) evacuation/pressuration cycles for each set of canisters.
- F. At the end of the evacuation/pressuration cycle, the canister is pressurized to 206 kPa (30 psig) with humid zero air. The canister is then analyzed by a GC-MS or GC-FID-ECD analytical system. Any canister that has not tested clean (compared to direct analysis of humidified zero air of less than 0.2 ppbv of targeted VOCs) should not be used. As a "blank" check of the canister(s) and cleanup procedure, the final humid zero air fill of 100% of the canisters is analyzed until the cleanup system and canisters are proven reliable (less than 0.2 ppbv of targets VOCs). The check can then be reduced to a lower percentage of canisters.
- G. The canister is reattached to the cleaning manifold and is then reevacuated to  $< 0.05$  mm Hg and remains in this condition until used. The canister valve is closed. The canister is removed from the cleaning system and the canister connection is capped with a stainless steel fitting. The canister is now ready for collection of an air sample. An identification tag is attached to the neck of each canister for field notes and chain-of-custody purposes.

## **SAMPLING SYSTEM CLEANING AND CERTIFICATION PROCEDURES**

### **Cleaning Sampling System Components**

- A. Sample components are disassembled and cleaned before the sampler is assembled. Nonmetallic parts are rinsed with HPLC grade deionized water and dried in a vacuum oven at 50°C. Typically, stainless steel parts and fittings are cleaned by placing them in a beaker of methanol in an ultrasonic bath for 15 minutes. This procedure is repeated with hexane as the solvent.
- B. The stainless steel parts are then rinsed with HPLC grade deionized water and dried in a vacuum oven at 100°C for 12 to 24 hours.
- C. Once the sampler is assembled, the entire system is purged with humid zero air for 24 hours.

### **Humid Zero Air Certification - (see Section 6.1)**

(Note: In the following sections, "certification" is defined as evaluating the sampling system with humid zero air and humid calibration gases that pass through all active components of the sampling system. The system is "certified" if no significant additions or deletions [less than 0.2 ppbv of targeted compounds] have occurred when challenged with the test gas stream.)

- A. The cleanliness of the sampling system is determined by testing the sampler with humid zero air without an evacuated gas cylinder, as follows.
- B. The calibration system and manifold are assembled, as illustrated in Attachment G. The sampler (without an evacuated gas cylinder) is connected to the manifold and the zero air cylinder activated to generate a humid gas stream (2 l/min) to the calibration manifold (see Attachment G [b]).
- C. The humid zero gas stream passes through the calibration manifold, through the sampling system (without an evacuated canister) to a GC-FID-ECD analytical system at 75 cm<sup>3</sup>/min so that 40 cm<sup>3</sup>/min is pulled through the six-port valve and routed through the cryogenic trap (see EPA reference Compendium Method T0-14, Section 10.2.2.1) at the appropriate time while the extra sample is vented. (Note: The exit of the sampling system [without the canister] replaces the canister in Attachment H.) After the sample (400 ml) is preconcentrated on the trap, the trap is heated and the VOCs are thermally desorbed onto the head of the capillary column. Since the column is at -50°C, the VOCs are cryofocussed on the column. Then, the oven temperature (programmed) increases and the VOCs begin to elute and are detected by a GC-MS (see EPA reference Section 10.2) or the GC-FID-ECD. The analytical system should not detect greater than 0.2 ppbv of targeted VOCs in

order for the sampling system to pass the humid zero air certification test. Chromatograms of a certified sampler and contaminated sampler are illustrated in Attachment J (a) and (b), respectively. If the sampler passes the humid zero air test, it is then tested with humid calibration gas standards containing selected VOCs at concentration levels expected in field sampling (e.g., 0.5 to 2 ppbv) as follows:

**Sampler System Certification with Humid Calibration Gas Standards - (see Section 6.1)**

- A. Assemble the dynamic calibration system and manifold as illustrated in Attachment G.
- B. Verify that the calibration system is clean (less than 0.2 ppbv of targeted compounds) by sampling a humidified gas stream, without gas calibration standards, with a previously certified clean canister (see EPA reference Section 12.1).
- C. The assembled dynamic calibration system is certified clean if less than 0.2 ppbv of targeted compounds are found.
- D. For generating the humidified calibration standards, the calibration gas cylinder(s) (see EPA reference Section 8.2) containing nominal concentrations of 10 ppmv in nitrogen of selected VOCs, are attached to the calibration system, as outlined in EPA reference Section 10.2.3.1. The gas cylinders are opened and the gas mixtures are passed through 0 to 10 cm<sup>3</sup>/min certified mass flow controllers to generate ppb levels of calibration standards.
- E. After the appropriate equilibrium period, attach the sampling system (containing a certified evacuated canister) to the manifold, as illustrated in Attachment G (a).
- F. Sample the dynamic calibration gas stream with the sampling system according to EPA reference Section 9.2.1. (Note: To conserve generated calibration gas, bypass the canister sampling system manifold and attach the sampling system to the calibration gas stream at the inlet of the in-line filter of the sampling system so the flow will be less than 500 cm<sup>3</sup>/min.)
- G. Concurrent with the sampling system operation, real-time monitoring of the calibration gas stream is accomplished by the on-line GC-MS or GC-multidetector analytical system (Attachment G [b]) to provide reference concentrations of generated VOCs.
- H. At the end of the sampling period (normally same time period used for anticipated sampling), the sampling system canister is analyzed and compared to the reference GC-MS or GC-multidetector analytical system to determine if the concentration of the targeted VOCs was increased or decreased by the sampling system.
- I. A recovery of between 90% and 110% is expected for all targeted VOCs.

## CANISTER SAMPLING FIELD DATA SHEET

LOS ALAMOS NATIONAL LABORATORY ENVIRONMENTAL RESTORATION CANISTER SAMPLING FIELD DATA SHEET		Date: _____ Sheet _____ of _____
Technical Area _____ Operable Unit _____		Expected Sample Concentration <input type="checkbox"/> HIGH ( $\geq 1000$ ppm) <input type="checkbox"/> LOW ( $\leq 1000$ ppm)
Site Work Plan: _____ Signature: _____		<div style="border: 1px dashed black; padding: 2px; display: inline-block;">           AFFIX FIRST SAMPLE STICKER HERE         </div> <div style="border: 1px dashed black; padding: 2px; display: inline-block; margin-left: 20px;">           AFFIX LAST SAMPLE STICKER HERE         </div>

SAMPLING INFORMATION						
Canister Serial No.: _____			Canister Leak Check Date: _____			
TEMPERATURE						
	SU	AMBIENT	MAXIMUM	MINIMUM		
START						
STOP						
PRESSURE (psig)						
CANISTER PRESSURE						
SAMPLING TIMES						
	LOCAL TIME	ELAPSED TIME METER READING				
START						
STOP						
FLOW RATES (cm <sup>3</sup> /min)						
	MANIFOLD FLOW RATE	CANISTER FLOW RATE	FLOW CONTROLLER READOUT			
Zero Reading: _____ cm <sup>3</sup> /min						
SAMPLING SYSTEM CERTIFICATION DATE: _____ QUARTERLY RECERTIFICATION DATE: _____						

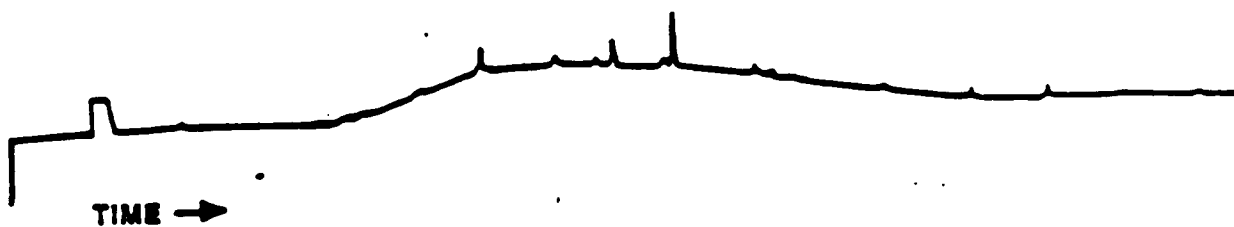
LABORATORY INFORMATION:	
DATE RECEIVED: _____	
RECEIVED BY: _____	
INITIAL PRESSURE: _____	GC-FID-ECD DATE: _____
FINAL PRESSURE: _____	GC-MSD-SCAN DATE: _____
DILUTION FACTOR: _____	GC-MSD-SIM DATE: _____
RESULTS: _____	
_____	
_____	
GC-FID-ECD: _____	
GC-MSD-SCAN: _____	
GC-MSD-SIM: _____	
<input type="checkbox"/> CHECK HERE IF CONTINUED ON BACK OF THIS SHEET	

## DATA FORM COMPLETION

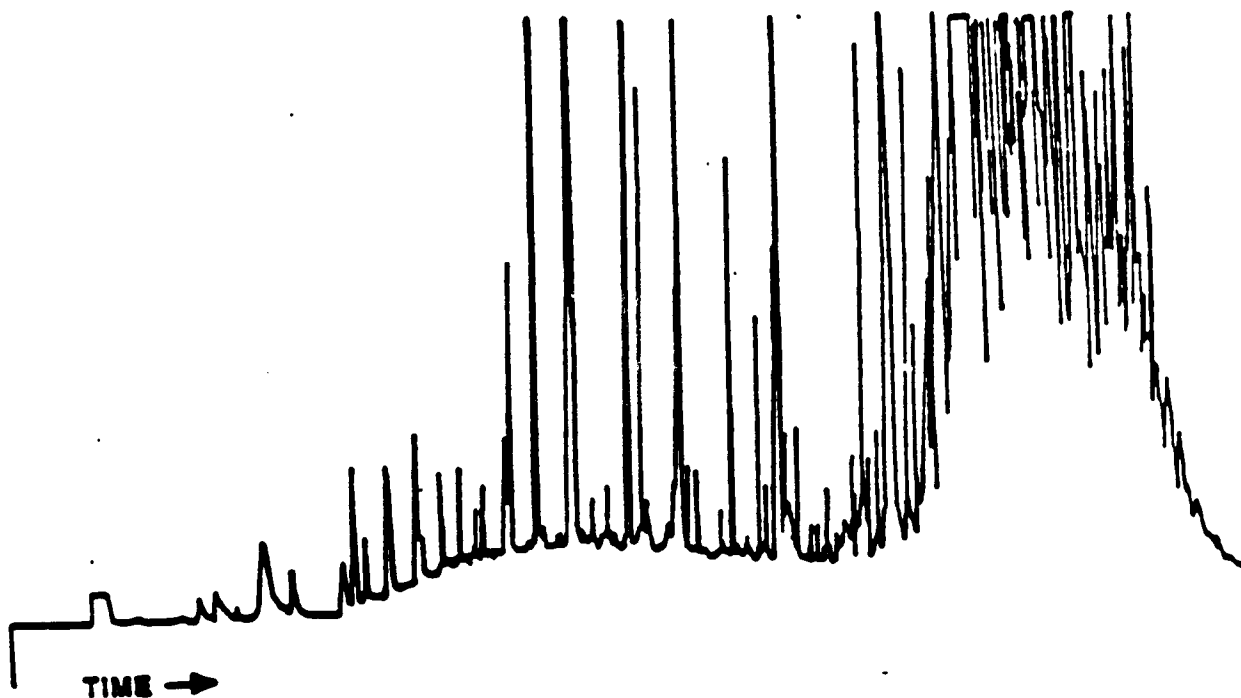
Use an indelible dark ink pen. Make an entry in each entry blank. For entry blanks for which no data are obtained, enter UNK for Unknown, NA for Not Applicable, ND for Not Done, etc. To change an entry, draw a single line through it, add the correct information above it, and date and initial the change. For all forms, complete the following information:

1. Technical Area (TA). Two-digit number indicating in which area the sampling is being done
2. Operable Unit (OU). Four-digit number indicating the operable unit in which the sampling is being done
3. Expected Sample Concentration. Value determined by field measurements. This value is critical for the Laboratory. Make every effort to make a determination.
4. Site Work Plan. The name of the plan and it's date of application.
5. Signature: A legible signature of the field team leader or his designate.
6. Canister Serial Number. The number that is stamped on the connector. This is not the sample number.
7. Temperature
  - Interior. The temperature in the insulated enclosure
  - Ambient. The temperature outside the insulated enclosure
  - Maximum. The maximum temperature inside the box during sampling
  - Minimum. The minimum temperature inside the box during sampling
8. Pressure. The starting pressure for subatmospheric/pressure will be negative. The ending pressure for subatmospheric should be negative and positive for pressure sampling
9. Sampling Times. Record the start and stop times and the elapsed time from the meter
10. Flow rates
  - Manifold Flow Rate. Flow rate for inlet flow manifold
  - Canister Flow Rate. Flow rate downstream of the mass flowmeter
  - Flow Controller readout. The value read directly from the Mass Flow Control Unit
  - Zero reading. This is taken time mass flowmeter (Refer to Section 6.0E)
11. Sampling System Certification Date. The date when the system was initially certified
12. Quarterly Recertification Date. Sample equipment must be calibrated on a quarterly basis
13. Laboratory Information. Data filled out by the Laboratory

**EXAMPLE OF HUMID ZERO AIR TEST RESULTS FOR (a) A CLEAN SAMPLER  
AND (b) A CONTAMINATED SAMPLER**



**(a). Certified Sampler**



**(b). Contaminated Sampler**